



**KAIMOSI FRIENDS UNIVERSITY
SECOND YEAR FIRST SEMESTER UNIVERSITY
EXAMINATIONS
2025/2026 ACADEMIC YEAR**

SPECIAL EXAMINATIONS

**FOR THE DEGREE OF BACHELOR OF SCIENCE (IT) / BACHELOR OF
SCIENCE (COMPUTER SCIENCE)**

COURSE TITLE: INTERACTIVE PROGRAMMING AND TECHNOLOGIES

COURSE CODE: BIT 324 / BCS 353

DATE: 23/6/26

TIME: 12-2PM

INSTRUCTIONS TO STUDENTS

1. **ANSWER QUESTION ONE AND ANY OTHER TWO FROM THE CHOICES GIVEN.**
2. **PHONES, SMART WATCHES, EAR PHONES OR ANY OTHER UNAUTHORIZED DIGITAL AND AI GADGETS AND APPLICATIONS ARE NOT ALLOWED IN THE EXAMINATION ROOM.**
3. **ANSWER ALL QUESTIONS IN THE EXAM ANSWER BOOKLET PROVIDED.**
4. **DO NOT WRITE ON THIS QUESTION PAPER.**
5. **ALL KAFU EXAMINATION RULES AND REGULATIONS APPLY.**
6. **DURATION OF EXAMINATION: TWO (2) HOURS**

KAFU observes ZERO tolerance to examination cheating.



Kaimosi Friends University (KAFU) is 9001:2015 certified

QUESTION ONE (30 MARKS) – COMPULSORY

- (a) Define the term Application Programming Interface (API). **(2 marks)**
- (b) Explain the difference between synchronous and asynchronous code execution. **(2 marks)**
- (c) State TWO purposes of User Experience (UX) fundamentals in the design process. **(2 marks)**
- (d) Identify TWO popular modern frameworks used for building interactive user interfaces and name the company or community that maintains each. **(2 marks)**
- (e) Describe the role of an event listener in event-driven programming. **(2 marks)**
- (f) Outline THREE characteristics of an interactive system that contribute to a positive user experience. **(3 marks)**
- (g) Explain why performance optimization is critical for the success of an interactive web application. **(2 marks)**
- (h) The following JavaScript code snippet is intended to change the background color of a div with the id "myBox" to blue when the mouse hovers over it, and back to gray when the mouse leaves. It contains **FOUR errors**. Identify each error and provide the correct code. **(5 marks)**

```

<!-- Assume this HTML exists -->
<div id="myBox" style="width:100px;height:100px;background-color:gray;">Hover over me
</div>

<script>
let box = document.getElementById("myBox");

// Error 1: Incorrect event type for mouse enter
box.addEventListener("mouseenter", function() {
  // Error 2: Incorrect property for changing color
  box.style.backgroundColor = "blue";
});

// Error 3: Incorrect event type for mouse leave

```



```

box.addEventListener("mouseleave", function() {
  box.style.backgroundColor = "gray";
});
// Error 4:
</script>

```

(i) The React component below is intended to display a counter with a button that increments the count. It contains **FOUR errors**. Identify each error. **(4 marks)**

```

import React, { useState } from 'react';

function Counter() {
  // Error 1: Incorrect useState destructuring
  const [count, setCount] = useState(0);

  // Error 2: State mutation attempt
  const increment = () => {
    count = count + 1;
  };

  // Error 3: Missing return statement
  // Error 4: Incorrect event binding for button
  <div>
    <p>Count: {count}</p>
    <button onClick={increment()}>Increment</button>
  </div>
}

export default Counter;

```

(j) Write a simple HTML, CSS, and JavaScript program that performs the following:

- i. Creates a `div` element with an id "colorBlock" that is 200px wide, 200px high, and initially has a red background color. **(3 marks)**
- ii. Creates two buttons: one labeled "Blue" and one labeled "Green". **(2 marks)**
- iii. Writes JavaScript functions so that clicking the "Blue" button changes the `div`'s background color to blue, and clicking the "Green" button changes it to green. **(3 marks)**



QUESTION TWO (20 MARKS)

- (a) Illustrate the concept of the **event loop** in JavaScript using a diagram. Explain how the call stack, callback queue, and microtask queue interact to handle asynchronous operations. **(6 marks)**
- (b) Compare and contrast **React Router** and **conditional rendering** for managing multi-page experiences in single-page applications. When would you choose one approach over the other? **(4 marks)**
- (c) Analyze the following UX problem: An e-commerce checkout form has a 10% abandonment rate at the payment step. Propose THREE specific UI/UX improvements to reduce this abandonment rate and justify each recommendation. **(6 marks)**
- (d) Explain the concept of **tree shaking** in modern JavaScript bundlers. How does it improve application performance? **(4 marks)**

QUESTION THREE (20 MARKS)

- (a) Design a **custom React hook** called `useLocalStorage` that synchronizes a state value with the browser's localStorage. Write the complete code for this hook and explain how it works. **(6 marks)**
- (b) Evaluate the use of **Web Workers** for handling computationally intensive tasks in a web application. Provide a concrete example where a Web Worker would be beneficial and describe the communication pattern between the main thread and the worker. **(6 marks)**
- (c) Describe the principles of **mobile-first design**. Why is this approach recommended for modern web development? **(4 marks)**
- (d) Distinguish between **synthetic events** in React and native DOM events. What advantages do synthetic events provide? **(4 marks)**

QUESTION FOUR (20 MARKS)

- (a) You are tasked with building a **real-time collaborative whiteboard** application. Evaluate the technical requirements and propose an architecture that includes:
- (i) The choice of communication protocol (WebSockets, Server-Sent Events, or HTTP polling). Justify your choice. **(3 marks)**
 - (ii) How you would handle conflict resolution when two users draw simultaneously. **(3 marks)**
 - (iii) The state management approach you would use on the frontend. **(2 marks)**



(b) Explain the concept of **code splitting** in React applications. Describe how `React.lazy()` and `Suspense` can be implemented to improve initial load time. Provide a code example. **(6 marks)**

(c) A client requests a website that works flawlessly on all devices from desktop to mobile, but has a limited budget. Recommend a **responsive design strategy** that maximizes efficiency while maintaining quality. **(4 marks)**

QUESTION FIVE (20 MARKS)

(a) Illustrate the concept of **higher-order components (HOCs)** in React. Provide a complete example of an HOC that adds loading state functionality to any component. **(6 marks)**

(b) Critique the following statement: "Automated testing for user interfaces is unnecessary because manual testing catches all issues." Provide a balanced argument discussing the strengths and limitations of both approaches. **(6 marks)**

(c) Explain the **CORS (Cross-Origin Resource Sharing)** mechanism. Why is it necessary for web security? Describe how to configure a server to allow requests from a specific frontend domain. **(4 marks)**

(d) Propose a **progressive web app (PWA)** strategy for a news website that needs to work offline. Describe the key components (service worker, cache API, manifest file) and how they would be implemented. **(4 marks)**

